RESPONSE TO COMMENTS on *Carson River: Phase I Draft Total Maximum Daily Loads for Total Phosphorus, June 2005*

Nevada Division of Environmental Protection (NDEP), September 2005

1. Response to Stephanie Wilson, U.S. EPA

a. Comment on Loadings and Allocations: Although we recognize that these TMDLs are phased TMDLs, we are concerned that the TMDLs do not include any allocations. Although it is difficult, we suggest that you consider developing load allocations which can be further refined as more data is collected. It is import to begin defining the source and source category load reductions which will assist in implementation of control strategies. We realize that you are planning to include load reduction estimates in the upcoming watershed plan, but we also feel it would be important to include that information in the TMDL as well.

NDEP Response: Allowable Loadings are defined by the duration curve as given by Equation 3 on page 18 of the TMDL. A more detailed discussion of the allowable loads and reductions to achieve these loads has been added to the Total Phosphorus (TP) TMDL. Reductions are simply the differences between the observed loads based on NDEP's water quality samples and the allowable loads determined from the duration curve for specific exceedance intervals that describe 5 separate general hydrologic conditions. More detailed source identification will be considered as resources become available.

b. Comment on the TMDL sites: It is a little confusing to have the TMDL sites in Table 1 with their corresponding reaches that are different than the reaches used for the water quality standards and the 303(d) listings. You should correlate the reaches in Table 1 with the reaches in Tables 2 and 3. For example, the EF from Stateline to Hwy 395 is not listed for TP. However your TMDL site # 3 extends from Mexican Gage to Stateline for Both Forks.

NDEP Response: The Nevada Administrative Code (NAC) designations have been added to Table 1 to enable the reader to cross reference with Table 2 and determine which regulatory reach is found **within** each TMDL segment.

2. Response to Ed James, Carson Water Subconservancy District

a. Comment regarding p. 21, first paragraph - Are the exceedances of the Total Nitrogen (TN) RMHQ based on annual or instantaneous averages at the four control points?

NDEP Response: It was decided that the statement in question is not necessary to the discussion and was removed to avoid any confusion.

b. Page 5, third paragraph - should be "The Nature Conservancy"

NDEP Response: The text has been revised.

c. Page 22, third paragraph - "such as local lawn or zoning ordinances". Do you mean local water law?

NDEP Response: The text has been revised.

3. Response to Paul Pugsley, Carson Valley Conservation District

a. Comment on the use of Duration Curves for Standards: The use of duration curves is a very appropriate tool to analyze pollutant loads to the Carson River and the District fully supports their use. We believe duration curves should also be incorporated in the determination of impairments for 303(d) listing, although that suggests that the NAC is changed to reflect a different way of expressing

the "standards".

NDEP Response: Changing the NAC is not a quick or simple process. Using Duration Curves to express the standards may be a method considered in the future to determine impairment of a waterbody.

b. Comment regarding loads from Ambrosetti Pond: In the Source Analysis Discussion, the Alvarez and Seiler (2004) report is cited for P loads from Ambrosetti Pond. Those sources are referenced as a percent of the phosphorous load in the river. The District believes this report is referencing a percentage of phoshorous introduced at Ambrosetti Pond as a portion of Phosphorous passing at Mexican Gage. Given the TMDL draft's preceding analysis showing increased levels of P at Mexican Gage versus WF Paynesville and EF Riverview, it would be very valuable to show what percentage of the increased levels was associated with the flow from Ambrosetti Pond, both from the summer and the winter. Could this be done in the context of duration curves which may "common" the flow characteristics between the two periods and identify the magnitude of the Ambrosetti Pond source?

NDEP Response: As discussed on page 21, further evaluation of the USGS Phosphorus Study Report will be addressed in the future updates of the TP TMDL.

c. Comment regarding dairies in Carson Valley: Potentially related to the Williams Slough/Ambrosetti Pond source and to the soil loading issue referred to in relation to the use of effluent water, is the issue of past dairy herds in Carson Valley and practices associated with their effluent. The District believes the dairies represent a significant potential P source due to loading in the soils. Given that almost all dairy herds have been sold in Carson Valley, any P input to the river is a very delayed reaction to the original source, but with no better understanding of soil loading issues, it is appropriate to include the dairies in the source analysis.

NDEP Response: Dairies will be listed in the TMDL as a possible source of phosphorous to the Carson River.

d. Comment regarding a soil loading analysis: Given the above discussion, we believe the Schedule of TMDL Updates or Revisions should include a soil loading analysis, to be completed sometime between September 2006 and December 2007.

NDEP Response: A soil loading analysis will be considered *if* resources are available for additional sampling and modeling.

e. Comment regarding possible nitrogen contribution: In the discussion of Possible Contribution of Nitrogen to Water Quality Impairment (3.5.1) the association of low oxygen levels and release of orthophosphate is mentioned. This suggests a relationship between nitrogen and phosphorous may exist, i.e. increased nitrogen levels lead to increased phosphorous levels. The potential of this occurrence will be addressed at least in part by the DRI diel oxygen study. The District believes these results should be incorporated as applicable in the TMDL and referenced for such in the Schedule of TMDL Updates or Revisions.

NDEP Response: The TP TMDL will discuss the results of the DRI Study in future updates.

f. Comments regarding suggested verbiage changes:

i. page 8, first complete paragraph, "...reported the East Fork (EF) at Williams Slough site..." should read "...reported the East Fork (EF) at Muller Lane site..."

NDEP Response: The text has been revised.

ii. page 10, paragraph below Table 4 refers to Table 4, not Table 5.

NDEP Response: The text has been revised.

iii. page 22, second paragraph of 3.5.4 "...such as local water lawn or zoning ordinances..." We are not sure of the use of lawn in this sentence, should it be local lawn watering?

NDEP Response: The text on page 23 has been revised.

iv. page 9, paragraph starting with "Hydrogeomorphic..." is the reference"...located on the main stem of the River downstream of Minden..." does not locate the site very well. Is the site better referred as
downstream of Genoa Lane or downstream of Cradlebaugh bridge (both are references used elsewhere).

NDEP Response: The text has been revised. The NDEP Physical Habitat sites in question are actually located on the East and West Forks just above the Confluence at Genoa Lane and upstream of Cradlebaugh Bridge.

v. page 9, paragraph staring with "Changes..." is the word "unmanaged" in reference to grazing practices. We believe a better expression would be “mismanaged" and that it should not be underlined.

NDEP Response: The text will be revised to include the word “mismanaged”.

4. Response to Pat Sollberger, Fisheries Biologist, Nevada Department of Wildlife

a. Comment regarding Standards and Best Management Practices (BMPs): In section 3.6, by June of 2008 you will determine if N or P standards warrant modification. We feel that standards are set to reduce anthropogenic inputs (ranching, golf courses, urbanization) in the Carson River, therefore, every attempt should be made to stay within the confines of the standard. With your understanding of general areas where non-point sources of P occur throught the river, there was very little discussion on how to alleviate these sources. We strongly recommend that you work with counties to include methods in their BMP’s for controlling P inputs to the river rather than relaxing standards.

NDEP Response: There is no discussion in the TP TMDL about relaxation of any standard. Future evaluation of the nutrient standards may determine that a more appropriate criterion for the support of the aquatic life beneficial use will be more restrictive than $\leq$0.1 mg/L Total Phosphorus.

NDEP does cooperate with other entities or individuals to implement BMPs and control P inputs from various land uses. NDEP provides grant money to interested property owners or organizations to develop education programs, restore riverbanks or install structural BMPs (as long as structure isn’t required by a permit) to mitigate pollution. The Nonpoint Source Program is voluntary; NDEP-Bureau of Water Quality Planning does not regulate BMP implementation.

Specific BMPs for alleviating or controlling P inputs will be discussed in the Watershed Plan being prepared by the Carson Water Subconservancy District. As discussed in the TMDL, NDEP believes that restoration and preservation of the riparian corridor is the best way to improve water quality.

b. Comment regarding the Fisheries: In Section 2.3 you discuss Aquatic Beneficial Uses and state that the fishery is a cold water fishery down to New Empire and a warm water fishery below. Although you extensively describe the poor state of the fishery, there is no discussion on how exceeding the phosphorus standard impacts the fishery.

NDEP Response: In the first paragraph under Section 3.1 on page 10, the TMDL states “Increases in P can cause excess algae growth, consumption of oxygen and subsequent death of aquatic life.” A

similar statement is found in the 2nd full paragraph on page 21. The term aquatic life, as used in the NAC, does include fish.

c. **Comment regarding increased monitoring:** There has been abundant, high-quality information collected and presented in this report. Based on the present data, however, we feel more detailed monitoring within the most troubled reaches is needed to precisely examine where mitigation would be most practical and effective.

NDEP Response: If resources become available, more detailed monitoring will be considered.

5. Response to Kelvin Ikehara, Carson City Public Works Operations Chief

a. **Comment regarding Ambrosetti Pond:** In reviewing the Carson River: Phase I, Total Maximum Daily Loads for Total Phosphorus, it indicated that most of the influence from total phosphorus occurs between Minden/Gardnerville and the New Empire gaging station below Deer Run Bridge. The study also points out that the treated effluent used in Carson Valley is a possible contributor. This treated effluent irrigates fields which drain to Williams Slough and Ambrosetti Pond, which eventually discharges to the Carson River. I believe if up to 42% of the total phosphorus loading is from this source, that better BMPs should be developed to minimize over irrigation which eventually enters the Carson River System.

NDEP Response: The "up to 42% of the total phosphorus loading" determined by the USGS refers to only one day of sampling during the 1st winter of the study when the flow on the main stem (Carson City gage) was low (137 cfs) and no irrigation was occurring. Flow measured at the outlet of Ambrosetti Pond was 27 cfs. This is not a constant or year-round contribution and may vary greatly year-to-year depending on hydrologic conditions. On 7/9/2002, discharge from Ambrosetti Pond was only 1.2 cfs. The phosphorus loading was from this source was determined to be almost 11% of the load measured at the Carson City Gage. Please refer to page 62 (right hand column) of the USGS Scientific Investigations Report 2004-5186. Text on page 12 of the TMDL has been modified to clarify the results reported by the USGS.

Indentifying the most effective BMPs to deal with the irrigation return flows and the discharge from Ambrosetti Pond is being discussed with Paul Pugsley, Manager of the Carson Valley Conservation District.

Ambrosetti Pond may receive less irrigation return flow in the future because of changing land use. One rancher that regularly used treated effluent on his fields has terminated his reuse permit and sold a portion of his property for development. Loss of agricultural land to urbanization is the greatest threat to the overall health of the river. Building in the floodplain and losing a riparian buffer that filters sediment and contaminants will drastically reduce the potential for improvements in water quality or habitat.

b. **Comment regarding units:** In Section 3.4 Pollutant Load Capacity and Allocation, the Flow units have been left out. It should be indicated that the flow is in cubic feet per second.

NDEP Response: The text has been revised.

c. **Comment regarding form of phosphorus:** It has been brought to my attention and the data also reflects this, that total phosphorus may not be the best form of phosphorus to base a TMDL since the organically bound phosphorus is not available for assimilation. If this is the case should the TMDL be based on total dissolved phosphorus?

NDEP Response: The Nevada Administrative Code, Sections 445A.147 through 445A.158, lists Total Phosphorus as the standard. Therefore impairment of river and development of the TMDL was based on TP and not OP or dissolved phosphorus. Future evaluation of the nutrient standards may

determine orthophosphorus is a more appropriate criterion for support of the aquatic life beneficial use.

6. Response to Dr. John Warwick, Desert Research Institute

a. Comment regarding effect of sediment input during the Comstock: The report overlooked the idea that massive sediment input occurred during the Comstock era. Published scientific papers indicate that added sediment resulted in Carson River channel aggradation of roughly two meters downstream stampmill sites. An example of a peer reviewed journal publication is given below, but there are several papers that should be cited; I suggest looking at Jerry Miller's and Paul Lechler's work for more information.

Miller, J., Barr, R., Grow, D., Lechler, P., Richardson, D., Waltman, K., and Warwick, J.J., 1999. "Effects of the 1997 Flood on the Transport and Storage of Sediment and Mercury within the Carson River Valley, West-Central Nevada," *Journal of Geology*, Vol. 107, pp. 313-327.

NDEP Response: The sediment input from the Comstock Era was not explicitly cited as discussed in Miller et al (1999). However, the 3rd and 4th paragraph on page 9 of the TMDL does briefly describe the impacts of logging and mining on the river.

b. Comment regarding phosphorus cycling: The report should articulate the specific processes that comprise a river channel's natural assimilative capacity with respect to phosphorus. Phosphorus can be removed temporarily by physical sedimentation and biological uptake. However, unlike nitrogen (through the process of denitrification), phosphorus species simply cycle between organic and inorganic forms with no long-term net removal mechanisms. Longer term storage occurs within a floodplain, however river flooding is a relatively rare event which does not directly impact phosphorus assimilative capacity during most of the year when the river is not in flood stage.

NDEP Response: The text has been revised under Section 3.2 (Source Analysis) to include a brief discussion of phosphorus recycling.

c. Comment regarding P soil saturation: The reported number of phosphorus violations over time do not apparently support the idea of phosphorus soil saturation over time since the number of violations do not seem to be increasing over time.

NDEP Response: This is a complex issue that would require evaluation of several uncontrolled variables. As stated in the TMDL (p. 12), more investigation would be needed to determine if phosphorus enrichment has actually occurred after years of treated effluent application. Ambient soil moisture conditions, weather, field topography, distance of irrigated field from the return flow ditch or river and the relatively low discharge from Ambrosetti Pond would limit the influence of treated effluent on the observed concentrations in the river. Contributions are seasonal and sampling on a monthly or bimonthly basis may not be enough to detect significant inputs.

d. Comment regarding instream flows: If water quality standards are being set to protect desired habitat, then why are there no minimum in-stream flow standards to also create and protect the same habitat goals? Without adequate flow, fish survival is likely not limited by the phosphorus concentration but rather by the amount of flow, temperature, and dissolved oxygen available.

NDEP Response: NDEP agrees that flow is a significant factor affecting aquatic life and the overall health of the river. However, based on our experience, EPA will not approve TMDLs based on lack of sufficient flow. The Clean Water Act (Section 101(g)) does not grant states the authority to set flow standards in our regulations that would supersede allocated water rights. Carson River water is fully appropriated and creative methods to obtain flow for support of aquatic life would have to be found without reducing or eliminating water rights established by the Alpine Decree.

e. **Comment regarding the NPS model:** Peer reviewed journal paper cited below estimated non-point source loading through much of the domain of interest using NDEP data coupled with water quality modeling.

Warwick, J.J., Cockrum, D., and Horvath, M., 1997. "Estimating Non-Point Source Loads and Associated Water Quality Impacts for the Carson River, Nevada," *Journal of Water Resources Planning and Management, ASCE*, Vol. 123, No. 5, pp. 302-310.

NDEP Response: The authors of the above journal article estimated removal of 70% of the combined TN, TP and CBOD loads to achieve a minimum dissolved oxygen value of 3.0 mg/L as the optimum reduction scenario. Only one day's worth of data (July 31, 1990) collected under low flow conditions was utilized to calibrate the model. A duration curve provides a simple, illustrative method to evaluate violation of the TP standard under all flow conditions using the entire water quality data set for the period of record.

f. **Comment regarding Nitrogen reporting limit:** You are correct to note the problem with the 0.50mg-N/L reporting level by the State Health Lab. This situation should be addressed by either instructing the State Health Lab to use more sensitive analytical methods or by having the water samples run by another laboratory. If not addressed the collected water quality data will be useless to future TMDL efforts involving nitrogen**.**

NDEP Response: NDEP and the State Health Lab have resolved the problem. The analytical method was modified to obtain the lower reporting limit (0.1 mg/L NO3-N).

7. Response to Brian Williams, Alpine County Planning Department

Comment regarding Implementation: Although this just applies in Nevada, will implementation of the TMDL have any possible implications in Alpine County? Could Management solutions involve actions in the upper watershed in order to meet the Nevada TMDL?

NDEP Response: According to NDEP's sample data and standards, the East and West Forks of the Carson River flowing into Nevada from California are not impaired for Total Phosphorus. Our analysis has identified reaches in Nevada that will be the focus of mitigation efforts. If any future analysis indicates pollutant loads are originating in California and impacting loads in Nevada, NDEP would work with Alpine County and the Carson River Coalition to identify practical management solutions.

8. Response to Ed Skudlarek, Nevada Department of Natural Heritage

Comment regarding Phytoplankton: Do the relatively high TKN and Turbidity values suggest a lot of phytoplankton is present?

NDEP Response: The high TKN and turbidity is related to organic matter such as detached benthic algae (periphyton) in the river. Turbidity is also related to the sediment load, but it is unknown what percentage of the particulate load can be contributed to either sediment or organic matter. One may dominate over the other depending on season/flow. A study conducted by the Oregon Water Resources Research Institute* reported that the Total Suspended Solids load in two creeks located in the Central Oregon Coastal Range averaged approximately 40% organics and 60% inorganic sediments.

*Beschta, R.L., O'Leary, S.J., Edwards, R.E., and Knoop, K.D., 1981. Sediment and organic matter transport in Oregon Coast Range streams: Oregon Water Resources Research Institute, 70.